

CLAIMS

What is claimed is:

- 1 1. A semiconductor laser, comprising:
 - 2 a first optical gain element that generates a first
 - 3 light beam having a first optical frequency;
 - 4 a second optical gain element that generates a second
 - 5 light beam having a second optical frequency;
 - 6 an optical frequency mixer that is coupled to said
 - 7 first and second gain elements and generates a polarization
 - 8 wave at a third optical frequency; and
 - 9 a near-field phase grating that couples a power from
 - 10 the polarization wave to an electromagnetic wave
 - 11 propagating at the third optical frequency.
- 1 2. The laser of claim 1, wherein the third optical
- 2 frequency is in the mid-infrared, long-infrared or
- 3 Terahertz regions.
- 1 3. The laser of claim 1, wherein said optical
- 2 frequency mixer includes a waveguide optically coupled to
- 3 said first and second gain elements.

1 4. The laser of claim 1, wherein the electromagnetic
2 wave propagates in a direction essentially perpendicular to
3 a propagation direction of the first and second light
4 beams.

1 5. The laser of claim 1, wherein the semiconductor
2 laser is fabricated with group III-V material.

1 6. A semiconductor laser, comprising:
2 a first optical gain element that generates a first
3 light beam having a first frequency;
4 a second optical gain element that generates a second
5 light beam having a second frequency;
6 mixing means for mixing the two light beams to create a
7 polarization wave at a third optical frequency, and;
8 means for coupling a power of the polarization wave to
9 an electromagnetic wave propagating at the third optical
10 frequency.

1 7. The laser of claim 6, wherein the third optical
2 frequency is in mid-infrared, long-infrared or Terahertz
3 regions.

1 8. The laser of claim 6, wherein said mixing means
2 includes a waveguide for mixing said first and second light
3 beams.

1 9. The laser of claim 6, wherein the electromagnetic
2 wave propagates in a direction essentially perpendicular to
3 a propagation direction of the first and second light
4 beams.

1 10. The laser of claim 6, wherein the semiconductor
2 laser is fabricated with group III-V material.

1 11. A method for operating a semiconductor laser,
2 comprising:
3 generating a first light beam having a first optical
4 frequency;
5 generating a second light beam having a second optical
6 frequency;
7 mixing the two light beams to create a polarization
8 wave at a third optical frequency, and,

9 coupling a power of the polarization wave to an
10 electromagnetic wave propagating at the third optical
11 frequency.

1 12. The method of claim 11, wherein the third optical
2 frequency is in the mid-infrared, long-infrared or
3 Terahertz regions.

1 13. The method of claim 11, wherein the first and
2 second light beams are mixed in a waveguide.

1 14. The method of claim 11, wherein the
2 electromagnetic wave propagates in a direction essentially
3 perpendicular to a propagation direction of the first and
4 second light beams.